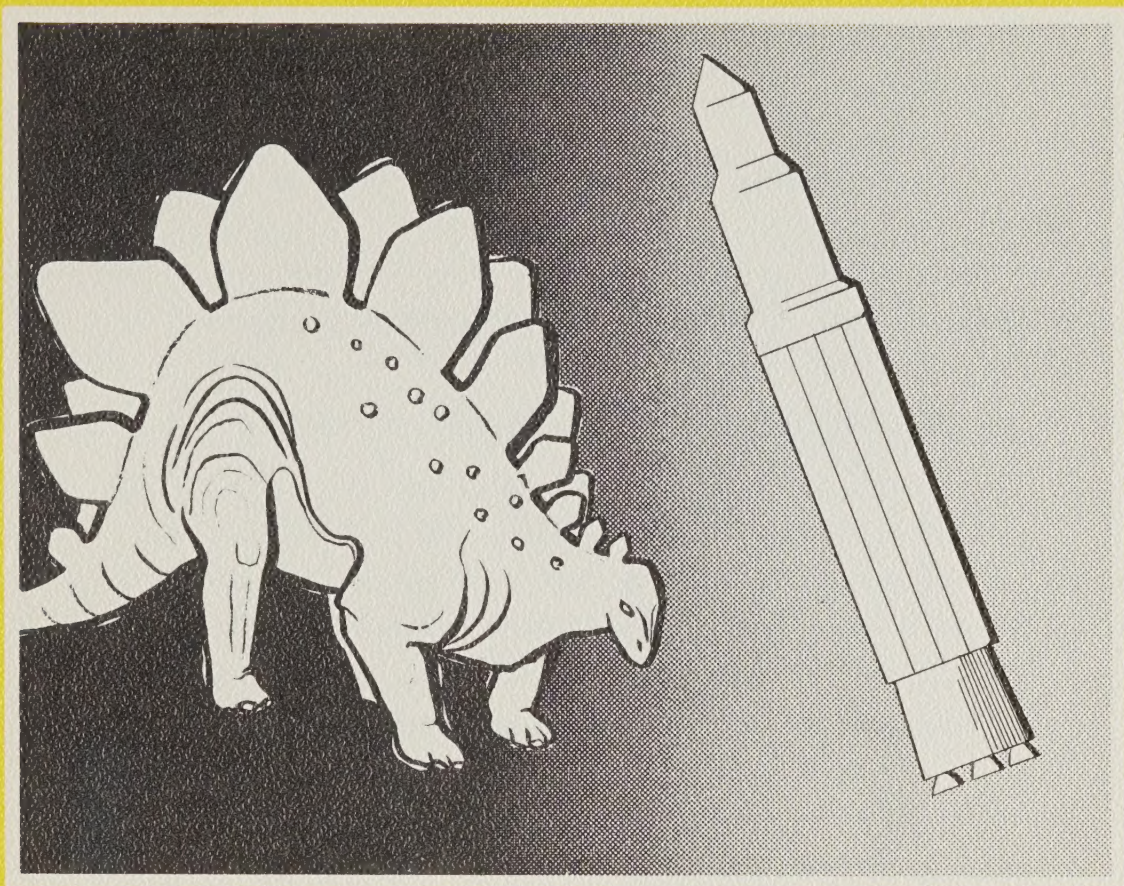


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DEPT. OF EDUCATION
HISTORICAL COLLECTION



SCIENCE

junior division – volume two

EDUCATIONAL TELEVISION SERIES 1967-68



Educational Television Branch
ONTARIO DEPARTMENT OF EDUCATION
1670 Bayview Avenue/Toronto 17

program schedule

SCIENCE
junior

10 programs
First in series is one half-hour in length; others are twenty minutes.

PROGRAM NO.	CBC 10:00	CBC REPEAT 10:00	CBOT 9:40	CHCH 9:30	CJOH CJSS 9:30	CKCO 9:30	CKCO REPEAT 9:30
1	Oct. 16	Mar. 27	Oct. 30	Oct. 24	Oct. 17	Oct. 23	Apr. 3
2	Oct. 23	Apr. 3	Nov. 6	Oct. 31	Oct. 24	Oct. 30	Apr. 10
3	Oct. 30	Apr. 10	Nov. 13	Nov. 7	Oct. 31	Nov. 6	Apr. 17
4	Nov. 6	Apr. 17	Nov. 20	Nov. 14	Nov. 7	Nov. 13	Apr. 24
5	Nov. 13	Apr. 24	Nov. 27	Nov. 21	Nov. 14	Nov. 20	May 1
6	Nov. 20	May 1	Dec. 4	Nov. 28	Nov. 21	Nov. 27	May 8
7	Jan. 10	Jan. 12 (10:10)	Jan. 22	Jan. 16	Jan. 9	Jan. 17	Jan. 19 (9:40)
8	Jan. 17	Jan. 26 (10:10)	Jan. 29	Jan. 23	Jan. 16	Jan. 24	Feb. 2 (9:40)
9	Jan. 24	Feb. 6 (10:10)	Feb. 19	Feb. 2	Jan. 30	Jan. 31	Feb. 9 (9:40)
10	Jan. 31	Feb. 9 (10:10)	Feb. 26	Feb. 13	Feb. 6	Feb. 7	Feb. 23 (9:40)

SCIENCE

4 programs of 20 minutes each for the junior grades

This is Volume 2 of a 2-volume series. The first 6 programs entitled "The Stream Community" were contained in Volume 1.

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Program nine <i>Rockets in the North</i>	7
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Optimum viewing conditions	inside back cover

Program planning committee:

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NORMAN MASSEY, "Rockets and Satellites"

general introduction to "Fossils and Dinosaurs"

The general purpose of these programs is to stimulate an awareness of the continuing evolutionary process of life. The programs have been designed to complement the study of living things in the past, a topic suggested for fourth year pupils in the Interim Revision Science (P1, J1), although the programs are equally suitable for grades 5 and 6. It is hoped that the presentation of material, which is not readily available to the classroom teacher, by the Curators of Geology and Vertebrate Palaeontology at the Royal Ontario Museum, will serve as a source of information and enrichment, as well as a stimulus to further enquiry on the part of the pupils.

FOSSILS

The specific aim of this program is to show that fossils are really a record of life. It is hoped that the viewing class will be motivated to search for fossils themselves, providing the surrounding area is suitable.

PROGRAM CONTENT

Dr. Tovell, Curator of Geology, opens the program by asking the viewers if they had ever thought how many different plants and animals there are in the world. He explains that a fossil is, in some way, the ancestor to some of the forms of life we have on earth today. A short film clip shows children looking for fossils among the sedimentary rocks of the Humber River Valley area near Toronto. Dr. Tovell then uses the reconstruction of life in Ontario 450 million years ago in the Royal Ontario Museum to explain how the fossilized remains, similar to those collected by the children, have given us this picture of ancient life. Specimens of cephalopods, brachiopods, clams and trilobites are later seen in close-up to illustrate how some forms of life have remained practically unchanged, some have evolved, while others have completely disappeared. A large wall exhibit illustrates the total variety of fossil life.

Dr. Tovell finally considers where fossils may be found. Five examples of good fossil-hunting territory are shown on a map of southern Ontario, although there are obviously many other suitable areas. Those areas shown are the Niagara Escarpment, Arcona Conservation Area, the Bruce Peninsula, Collingwood and the Humber Valley. The program ends with a word of advice on what to do and what to look for when fossil hunting.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Coral shales and limestones often contain fossils. Children could be encouraged to bring in any stones or rocks that have interesting markings, in an effort to classify them or establish the surrounding landform. A short preliminary discussion could then centre on what we can discover about our surroundings from such material.

SUGGESTED POST-VIEWING ACTIVITIES

1. The children could list the different forms of animal and plant life, as suggested by Dr. Tovell.
2. If possible, plan a trip to a quarry, or suitable place, to search for rocks with fossils. The children should plan carefully what equipment they need to take and how they will use it.
3. Arrange a visit to a museum wherever possible.
4. Encourage further reading and research into early life in the seas, climatic changes, or study local geographic conditions, etc.
5. Correlate to other subjects:
 - Art—murals, dioramas, models
 - mud or plaster prints
 - abstract pattern work—potato—lino cuts.

Creative writing—stories and poems.—The theme of life long ago could easily stimulate the imagination.

Science—A simple experiment to show sedimentation could be done by shaking coarse and fine particles (gravel and sand) into a jar of water. To show how ancient mud cracks, (frequently found in rock), were formed, a small amount of water poured over clay should be allowed to evaporate. The clay should then show similar cracks.

Bibliography

One of the simplest guides for children on this subject is:

LEMON, R. H. H., *Fossils of Ontario*. Royal Ontario Museum (Sales Desk, Price 40 cents).

For teachers the following may be of interest:

MATTHEWS, WILLIAM H., *Fossils—An Introduction to Prehistoric Life*. Barns and Noble. (Everyday Handbook).

NEWELL, NORMAN D., *Crises in the History of Life*. Scientific American Offprint No. 867. W. H. Freeman and Company, 660 Market Street, San Francisco, California 94104. (20 cents U.S.).

RHODES, F. H. T., *The Evolution of Life*. Penguin Books. (No. A512).

The Fossil Story—A film distributed free by the Shell Oil Company, is also of some relevance.

program eight

DINOSAURS

The objective of this program is to show that, having started in the water, life moved to the land and the air, and that the story is not yet complete.

PROGRAM CONTENT

The program opens with “Fido”, the mountain monitor lizard, in the Vertebrate gallery of the Royal Ontario Museum. Dr. Edmund, the Curator, introduces the idea that he, and “Fido”, as well as the dinosaurs, have something in common—a backbone. By the use of models, graphics and specimens, Dr. Edmund outlines the evolutionary development of life, and its movement to land, through the lobefish and the amphibian to the reptile. Commenting on the dominant group of reptiles, the dinosaurs, Dr. Edmund again emphasizes the evolutionary aspect: the first dinosaurs were small (*Coelophysis*) while the later ones (*Brontosaurus* and *Stegosaurus*) were huge. The significance of the egg is shown. Laboratory film reveals how palaeontologists piece together the story of life from bone fragments. In conclusion, the camera focuses on the skeletons of dinosaurs which inhabited Canada (e.g., *Edmontosaurus*) and the program ends by posing the questions of why and how these huge reptiles became extinct.

SUGGESTED PRE-VIEWING ACTIVITIES

1. The children might discuss how they thought life spread from the seas to the land and air. What developments would be required for this process?

2. The children might also bring to the classroom pet snakes and lizards for study. Those children who possess models of dinosaurs might also bring these for display and discussion.

SUGGESTED POST-VIEWING ACTIVITIES

- Immediate discussion after the program on the extinction of the dinosaurs and what type of life followed them
- Research and reports on specific groups of dinosaurs
- Further research into the development of mammals, the changes in vegetation and the development of plant life and reasons for variations in climatic conditions
- Similar correlation into art and creative writing which was done following program one on fossils

Bibliography

The literature on the subject is extensive. Some of the following would be suitable for the grade 4-6 age group.

ANDREWS, ROY CHAPMAN, *In the Days of Dinosaurs*. Random House, 1959.

ANDREWS, ROY CHAPMAN, *All about Strange Beasts of the Past*. Random House, 1959.

DARLING, LOIS AND LOUIS, *Before and After Dinosaurs*. Morrow, 1959.

SWINTON, W. E., *Dinosaurs of Canada*. R.O.M. Series.

For teachers:

HOTTON, NICHOLAS, *Dinosaurs*. Pyramid Publications.

PETERSEN, KAI, *Prehistoric Life on Earth*. Dutton.

general introduction to “Rockets and Satellites”

This section of the Junior Science series is designed to bring the topic of space science inside the classroom. Although “Space Travel” is listed for pupils of the fifth year in the Interim Revision Science (P1, J1), the programs will likely prove useful to children throughout the Junior Division.

Many ten-year-olds already have a lively interest in satellites and space vehicles. Others may find that these programs serve as starting points for an inquiry into the science of space. After these telecasts, discussions may develop and small groups may begin working on specific aspects which are described later.

No special preparation of the pupils is necessary before the telecasts, but the teacher should be ready to guide the discussion in the third segment. To assist the teacher, outlines of the two programs follow.

ROCKETS IN THE NORTH

PROGRAM CONTENT

The narrator, Mr. Percy Saltzman, introduces Mr. Philip de L. Markham, leader of the party of ten Canadians who launched a Black Brant sounding rocket in 1966 from Resolute Bay towards the North Magnetic Pole. In this first quarter of the program, the children will see the wooden boxes containing the rockets being freighted from Winnipeg, the launching mechanism being set up at Resolute, the nose-cone being added to the rocket, and the crew firing two Black Brants. Mr. Markham describes this expedition which probed the upper atmosphere from a launch site nearer the Magnetic Pole than ever before.

In the second quarter, Mr. Saltzman outlines the basic principle of rocket propulsion: the momentum of the rocket in one direction equals the momentum of the exhaust gases that are thrust out in the other direction. From a fireworks-rocket, the hot materials rush out downwards as the rocket moves upwards. Other examples of the principle are shown. A child releases a balloon and as the air flows out in one direction, the balloon moves in the other. As a boy dives from the stern of a boat, the boat moves forward. As a boy throws things from a boat, the boat moves the other way.

The Black Brant consists essentially of a metal shell and a layer of solid inflammable material inside it. When the solid propellant is ignited, hot gases are produced which stream out with great momentum. In nine seconds, a quarter ton of exhaust gases comes out the nozzle. The rocket case moves in the other direction with an equal momentum.

The third quarter is designed for discussion. Mr. Saltzman explains the idea somewhat like this:

"Any questions? Sorry. *I* can't answer them. I'm here and you're there. But your *teacher* can help you find answers. Or maybe *you* can answer some of your teacher's questions. Anyway this part of the program is strictly up to you. All *we'll* do is remind you of what you've seen, with some silent pictures . . . Then we'll be back."

Then your class will see a still picture of a technician lifting the nose-cone to attach it to the rocket. The teacher and class will have a chance to discuss what they see, *for there will be no music, no word, and no other sound from the telecast*. Gradually this still picture will fade out, and a second one of a rocket blast-off will quickly appear. Children will have a chance to ask their own questions about the smoke and flame. About a minute later this picture fades out and a still picture of a fireworks rocket appears. Children now may discuss what they see here. The fourth picture shows the boy diving from the boat so that the children may have a chance to use the word "momentum". The final picture shows a section through a rocket with labels pointing to nose-cone, casting, propellant, fins and nozzle. Again there is a chance for some free discussion before Mr. Saltzman reappears for the fourth quarter.

This last quarter of the program provides further information about rockets. Children can select as much or as little as they wish from this part of the program. They can use whatever parts they wish to augment their conceptions of space travel.

A film is shown of the launching of rockets from the Churchill Research Range. Churchill was selected for a rocket range because of its ideal location near the zone of greatest auroral activity and near good rail and sea transportation.

Small rockets land on the range south and east of Churchill, but the larger rockets are launched to impact in Hudson Bay when the navigation season is over. All rockets are launched from within specially designed buildings, enabling the technicians, scientists, and engineers to prepare the rockets in comfortable surroundings, protected from the extreme cold of winter.

Weather balloons are released before each rocket launching to find the direction and speed of winds near the ground and higher up. From this information, the direction of the launching is changed so that the rocket will make impact at the desired place. The rocket is tracked by radar. During the flight the scientist's apparatus sends messages back by radio. These messages are recorded on magnetic tape.

SUGGESTED POST-VIEWING ACTIVITIES

This program is meant to be a starting point for class discussions that will lead to inquiries by small groups and by individuals. These inquiries will follow children's questions, questions that cannot be predicted accurately in advance.

— Some children may want to find Resolute Bay, Churchill, and the Arctic Circle on a map. This may lead into the history of Churchill from Jens Munck's sailing into Churchill Harbour in 1619 to the construction of the first Hudson Bay Post in 1689 and the arrival of the railway in 1931.

— Some children may be interested in the earth's magnetism, and the way compasses work near the North Magnetic Pole. Others may want to read all they can about ice-fields, and icebreakers.

— Some may want to read of the pioneers in the conquest of space: Tsiolkovsky, Oberth and Goddard.

— Some may want to experiment with sausage-shaped balloons. If they are blown full, how far from a launch point will they travel? Does it matter the angle at which they are released? What is the effect of blowing them up only partially?

— Some children may find other rockets mentioned in the newspapers. Some will become interested in satellites, even before the next program on "Satellite Alouette".

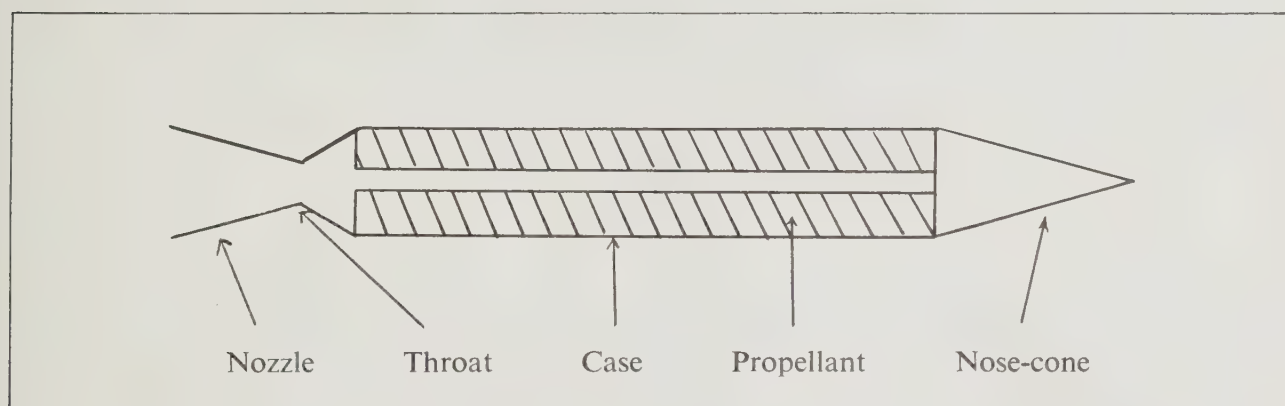
— Some children may seek out the message of the second segment: that space vehicles begin moving because they gain momentum and that this momentum originates because the exhaust gases have a momentum in the opposite direction. This message may seem important enough to the teacher, that he will support it by providing balloons for experimentation.

In short, as written on page 4 of the Interim Revision Science:

"The teacher's intention is to encourage each child to find out what he can. In doing this he should not set any limit on what the individual child may achieve. From a starting-point, the child can progress as far as time, resources, and interest allow; to ensure this a precise definition of content is avoided in the syllabus."

FURTHER INFORMATION

1. Solid fuel may be prepared in rockets. Solid fuel rockets are easily handled, and ignite dependably. However, solid fuel has less thrust than liquid fuels.
2. The Black Brant III has this rating: Payload 50 pounds, altitude 100 miles, diameter 10 inches, length 18 feet.
3. At Churchill the ice breaks in June and the snow disappears. Summer temperatures are in the 50° to 60° range, rising on occasion to 80°. Frost at night in summer is not uncommon. Relatively little rain falls during the summer. On the tundra, insect netting and repellent are essentials.
4. Aurora are most frequent at a height of about 65 miles.
5. Below is a simplified sketch of a rocket:



Bibliography

KUENTZ, CRAIG, *Understanding Rockets and Their Propulsion*. Rider, 1964. 152 pages

WILSON, J. TUZO, I.G.Y., *The Year of the New Moons*. Longmans, 1961. 352 pages

program ten

SATELLITE ALOUETTE

PROGRAM CONTENT

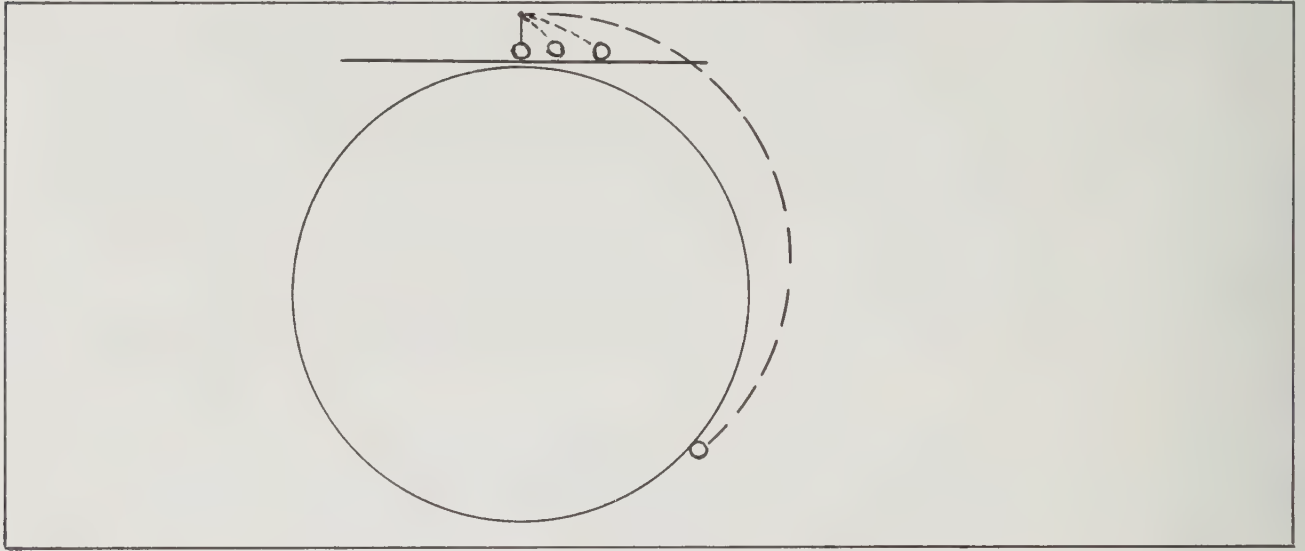
The narrator, Mr. Percy Saltzman, introduces Mr. F. T. Davies, Director of the Defense Research Board who was involved in the Alouette program. This satellite was designed to probe into the ionosphere, the part of the upper atmosphere that reflects radio waves back to the earth. The idea was to place a satellite in such an orbit that it could send signals down, right through the ionosphere, to receiving stations on the earth.

To place the satellite in orbit, a powerful rocket was used. Really it was a double rocket. One rocket, the Thor, lifted the rest and then the second rocket, the Agena B, finished the job by giving greater momentum to the satellite.

The "Alouette" was designed and built in Canada, and then placed in orbit on September 28, 1962 from a launching site in California.

The second quarter of the program describes how a satellite keeps orbiting the earth in a circle. A comparison is made with the throwing of a ball.

If a ball is dropped from the hand it will strike the floor in about half a second. If it is thrown sideways it will still strike the floor in half a second but it will travel ahead too. If it is thrown very fast it will travel a great distance before it strikes the floor.



If it thrown faster still it may travel part way around the world before it strikes the ground. If it could be thrown at a speed of 18,000 miles an hour it would circle the earth.

In the third quarter, several still pictures will be shown. Mr. Saltzman will propose a question which may be used as a beginning for a discussion. The pictures and the questions are listed below.

- Ball released from the hand
“What path does the ball take?”
- Ball thrown horizontally
“Where did the ball move?”
- Ball moving much faster over a curved earth
“What path does a ball take when it moves very fast?”
- Blast off for the Alouette Thor-Agena
“What is happening here?”
- Separation from the first stage
“What happens when the first stage burns up all its fuel?”
- Satellite in orbit with antennae extended
“Where were the antennae during launching?”
- Photo of Alouette
“What is the use of the solar cells that cover the satellite?”

In the last quarter, Mr. Davies describes how the signals were received, recorded, and stored.

SUGGESTED POST-VIEWING ACTIVITIES

This program serves as a starting point for inquiries into satellites, and the vehicles used in space programs.

- Some children may collect pictures and data about Alouette I and Alouette II. Others may read about Tiros, Synchron, Telstar and Early Bird, and find out how they are used for communication or for observations on the weather.
- Perhaps the whole class may discuss the significance of the first flights with men aboard satellites. Individuals or groups may wish to learn more of the astronauts—Gagarin, Tirov, Glenn, Nikolayev, Cooper and Valentina Tereshkova.
- Perhaps the children may begin to study the first satellite, the moon, and then the moons of other planets.

But the ventures of the pupils, whether they are made in groups or as a whole class, are not completed until they lead to a product. As written in Interim Revision Science (P1, J1):

“When a pupil has discovered something he will usually want to communicate his findings. The teachers’ role at this stage is to provide a diversity of materials, so that each child will choose the medium that will express his discovery in a satisfying way. Sometimes he will prefer to use the written word, sometimes the spoken word. He may choose to paint pictures or to build structures on a bench. On occasion he will make graphs and express his findings in numbers.”

FURTHER INFORMATION

1. Alouette II was launched on November 29, 1965 in an orbit with altitude ranging from 500 kilometers to 3,000 kilometers. The point at which the satellite was farthest from the earth is termed the *apogee*, the nearest point the *perigee*.
2. Sputnik I was launched on October 4, 1957. It fell back to earth on January 4, 1958. This first satellite carried few instruments but from the rate of slowing by drag something was learned about the density of the air.

FOR OPTIMUM VIEWING CONDITIONS

1. Review Teachers Guide well in advance of each telecast.
2. Have the set on and adjusted, sound off before the program begins.
3. Have suggested materials ready.
4. Be sure that you can observe both the program and your students' reactions during the telecast.
5. Assure student comfort by
 - locating the set for best viewing,
 - eliminating glare and reflection,
 - ventilating room properly,
 - placing seats within 20' of the screen.

This diagram shows the suggested placement of the television set:

